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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/665,204

09/22/2003

Gang Wang

031188

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23850

7590

09/22/2004

ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP
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WASHINGTON, DC 20006

EXAMINER

SEFER, AHMED N

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 09/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

OK

Application No.

10/665,204

Applicant(s)

WANG ET AL

Examiner

A. Sefer

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-16 is/are allowed.
- 6) ☒ Claim(s) 17-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 12/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. ("Kim") USPN 6,664,573 in view of Kunsakabe USPN 5,569,942.

Kim discloses in fig. 7 a semiconductor light-receiving device comprising: a semi-insulating substrate; a semiconductor layer 110 of a first conduction type that is formed on the semi-insulating substrate; a buffer layer 120 of the first conduction type that is formed on the semiconductor layer; a light absorption layer 140 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer of a second conduction type 150 that is formed on the light absorption layer; a semiconductor intermediate layer 130 of the first conduction type that is interposed between the buffer layer and the light absorption layer, but does not disclose a semiconductor intermediate layer having a higher impurity concentration than the buffer layer.

Kunsakabe discloses (fig. 4 and col. 4, lines 40-57) a semiconductor light-receiving device comprising: a semi-insulating substrate; a buffer layer 102 of the first conduction type having a concentration less the range recited (as in claim 18) that is formed on the semiconductor layer; a light absorption layer 103 that is formed on the buffer layer; and a semiconductor

Art Unit: 2826

intermediate layer 104 having a higher impurity concentration than the buffer layer (the lower range of intermediate layer is higher than the lower range of the buffer layer).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Kunsakabe's teachings with Kim's device since that would reduce the diode's noise level as taught by Kunsakabe.

As for claim 19, the specification contains no disclosure of either the critical nature of the claimed arrangement or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

As for claim 20, Kunsakabe discloses in fig. 6 a contact layer 215 of first conduction type interposed between the substrate and the buffer layers.

As for claim 21, Kunsakabe discloses a light absorption layer and the semiconductor layer of the second conduction type form a mesa structure, with light entering the light absorption layer through a side surface of the light absorption layer that is exposed in a process of forming the mesa structure.

3. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Kunsakabe as applied to claims 17 and 21 above, and further in view of Matsuda USPN 6,525,347.

The combined references do not disclose a waveguide path formed on a semi-insulating substrate.

Matsuda discloses (col. 5, 20-50) a semiconductor optical waveguide path that is formed on the semi-insulating substrate and guides light to the light absorption layer.

It would have been obvious to incorporate to Matsuda's teachings with the device of Kim and Kunsakabe, since that would achieve a PIN diode with a long wavelength passband properties as taught by Matsuda.

4. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Kunsakabe USPN 5,569,942.

Kim discloses in fig. 7 a semiconductor light-receiving device comprising: a semiconductor substrate of a first conduction type; a buffer layer 120 of the first conduction type that is formed on the semiconductor substrate; a light absorption layer 140 that is formed on the buffer layer and generates carriers in accordance with incident light; a semiconductor layer 150 of a second conduction type that is formed on the light absorption layer; and a high-concentration semiconductor intermediate layer 130 of the first conduction type that is interposed between the buffer layer and the light absorption layer, but does not disclose a buffer layer having a lower impurity concentration than the semiconductor substrate or an intermediate layer having a higher impurity concentration than the buffer layer.

Kunsakabe discloses (fig. 4 and col. 4, lines 40-57) a semiconductor light-receiving device comprising: a semi-insulating substrate 101 (col. 5, lines 55-58); a buffer layer 102 of the first conduction type having a lower impurity concentration than the semiconductor substrate that is formed on the semiconductor layer; a light absorption layer 103 that is formed on the buffer layer; and a semiconductor intermediate layer 104 having a higher impurity concentration than

Art Unit: 2826

the buffer layer (the lower range of intermediate layer is higher than the lower range of the buffer layer).

Therefore, it would have been obvious to one skilled in the art at the time the invention was made to incorporate Kunsakabe's teachings with Kim's device since that would reduce the diode's noise level as taught by Kunsakabe.

Allowable Subject Matter

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

5. Claims 1-16 are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Sefer whose telephone number is (571) 272-1921.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272-1915.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ANS
September 20, 2004